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Pollen morphology of *Bayabusua* (*Cucurbitaceae*) and its allies

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Summary. The pollen morphology of *Bayabusua* is discussed and compared with that of *Alsomitra*, *Neoalsomitra* and *Zanonia*, genera classified together with it in the subtribe Zanoniinae.

Comprehensive treatments of Cucurbitaceae pollen are scarce and include only light micrographs or no illustrations at all (Erdtman 1952, Marticorena 1963, Alyoshina 1971). From these works it appears that the subdivision into two subfamilies, Zanonioideae and Cucurbitoideae, is well supported by pollen morphology (see also Jeffrey 1964). Pollen of the Zanonioideae is uniform: small (up to 40 µm), prolate spheroidal to prolate, tricolporate or rarely tricolporoidate, usually striate, sometimes more or less reticulate. In contrast, Cucurbitoideae pollen is diverse, larger than 40 µm (up to more than 200 µm), with various aperture types, while (sub)prolate shapes and striate ornamentation are very rare.

The subtribes of the Zanonieae, the only tribe in the subfamily Zanonioideae, cannot be separated using pollen characters, at least not with the available data. Alyoshina (1971) placed most genera in the *Zanonia* pollen type; *Bolbostemma* and *Gerrardanthus*, which have slightly larger pollen grains with more or less reticulate ornamentation, were accommodated in the *Bryonia* type.

Macromorphological evidence indicates that *Bayabusua* belongs to the Zanoniinae, which further includes *Alsomitra*, *Neoalsomitra* and *Zanonia* (De Wilde & Duyfjes 1999). Pollen of this subtribe was studied by Erdtman (1952: *Neoalsomitra*), Marticorena (1963: *Alsomitra*, *Neoalsomitra*, *Zanonia*), Alyoshina (1966: *Neoalsomitra*; 1971: *Neoalsomitra*, *Zanonia*), Huang (1972: *Neoalsomitra*) and Sharma (1991: *Neoalsomitra*, *Zanonia*); pollen of *Bayabusua* has not been studied so far. The studies by Alyoshina and Huang contain light

micrographs. Nearly all species included by the above authors have small (40 µm), (sub)prolate, tricolporate, striate pollen; that of *A. macrocarpa* was described by Marticorena as "*sin estrías*" (not striate). *Neoalsomitra suberosa*, which was considered by Marticorena as deviating in the Zanonioideae, having large reticulate pollen, appeared to represent a monotypic genus in the Cucurbitoideae (Telford 1982, Jeffrey 1990).

In the present study, pollen of all four genera in the Zanoniinae is described and compared. All samples were acetolysed and studied with light (LM) as well as scanning electron microscopy (SEM), applying the techniques described by Van der Ham (1990). The terminology follows Punt *et al.* (1994).

Alsomitra macrocarpa (Blume) M. Roemer (Fig. 1A–C)

Pollen grains small (P × E = 19 × 21 µm), oblate spheroidal (P/E = 0.92), tricolporate with long shallow colpi and distinct endopores. Exine stratification indistinct (LM). Ornamentation perforate to indistinctly rugulate, with minute circular to irregularly slit-shaped lumina.
Material studied: *De Wilde & Duyfjes* 21886, Java.

Bayabusua clarkei (King) W.J. de Wilde (Fig. 1D–F)

Pollen grains medium-sized (P × E = 34 × 21 µm), prolate (P/E = 1.62), tricolporate with rather deep, very long colpi or partly syncolporate (Fig. 1D: colpi partly connected at one or both poles) and distinct endopores. Exine stratification indistinct (LM). Ornamentation striate, with small circular lumina between the muri.
Material studied: *De Wilde & Duyfjes* 21834, Peninsular Malaysia.

***Neoalsomitra* sp. 1** (Fig. 2A–C)

Pollen grains small (P × E = 17 × 17 µm), almost spheroidal (P/E = 0.99), tricolporate with long shallow colpi and rather indistinct endopores. Exine stratification more or less distinct (LM). Ornamentation striate, without lumina between the muri.
Material studied: *Kornassi* 1433, Moluccas.

***Neoalsomitra* sp. 2**

Pollen grains medium-sized (P × E = 32 × 25 µm), subprolate (P/E = 1.30), tricolporate with long, rather deep colpi and rather indistinct endopores. Exine stratification more or less distinct (LM). Ornamentation striate, without lumina between the muri.
Material studied: *For. Bur.* 3409, Philippines.

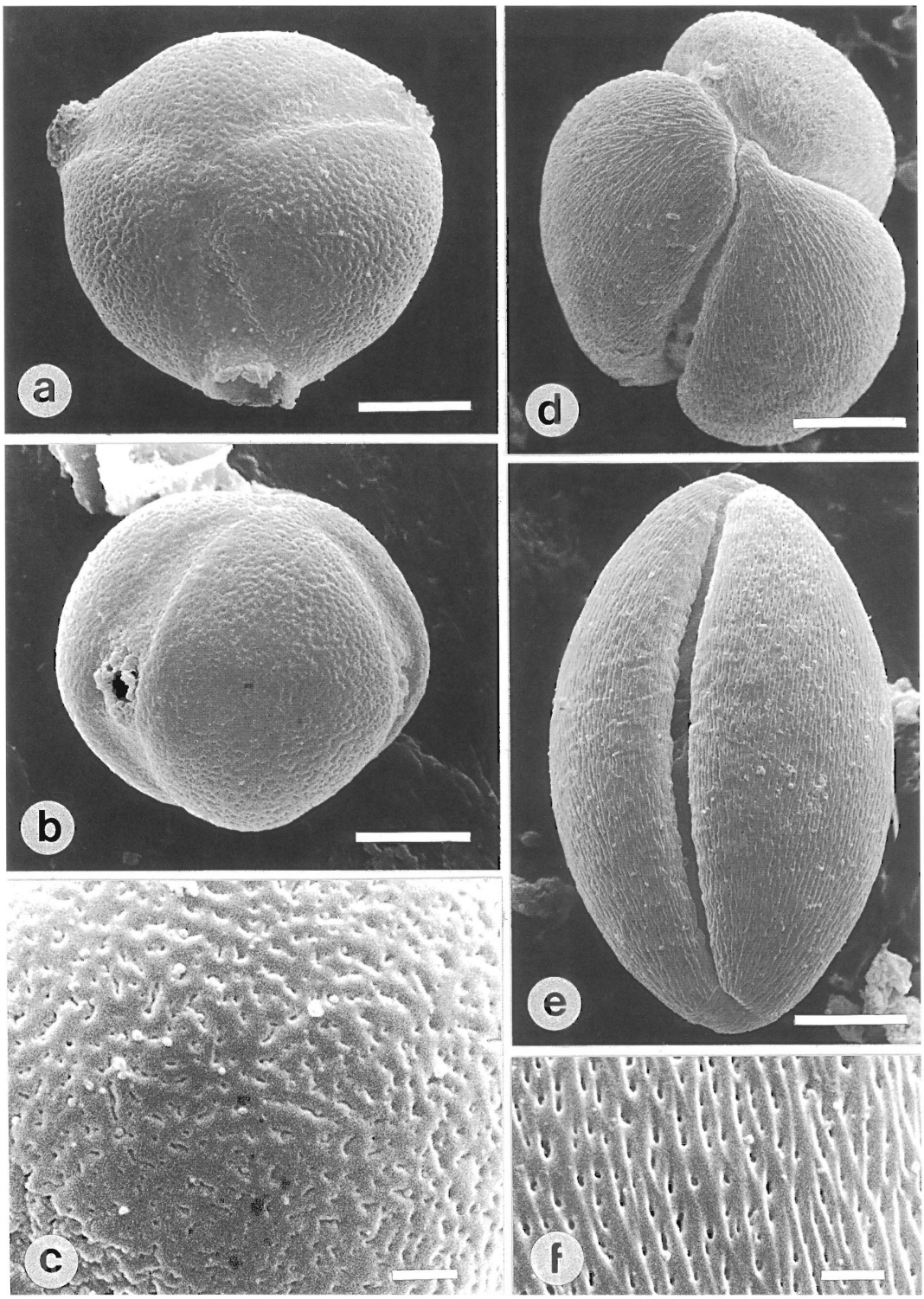

Fig. 1. A–C: pollen of *Alsomitra macrocarpa*. A. Polar view. B. Almost equatorial view. C. Detail of perforate to indistinctly rugulate ornamentation. D–F: pollen of *Bayabusua clarkei*. D. Polar view (colpi partly connected). E. Equatorial view. F. Detail of striate ornamentation, showing small lumina between the muri.

Bar = 5 μm (A, B, D, E) or 1 μm (C, F). All SEM.

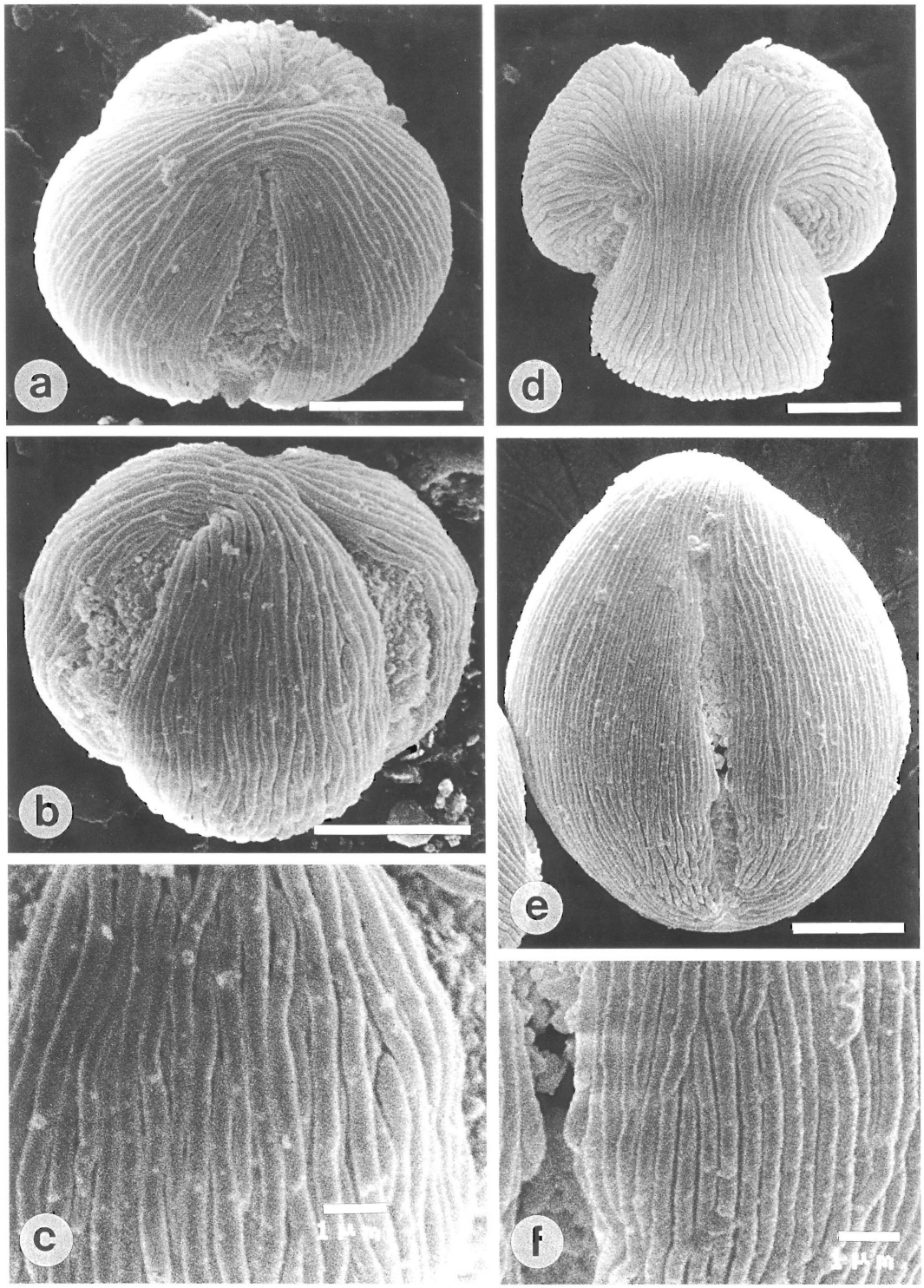

Fig. 2. A–C: pollen of *Neoalsomitra* sp. 1. A. Almost polar view. B. Oblique equatorial view. C. Detail of striate ornamentation, showing no lumina between the muri. D–F: pollen of *Zanonia indica*. D. Polar view. E. Equatorial view. F. Detail of striate ornamentation, showing no lumina between the muri. Bar = 5 μm (A, B, D, E) or 1 μm (C, F). All SEM.

Zanonia indica L. (Fig. 2D–F)

Pollen grains medium-sized (P × E = 28 × 22 µm), subprolate (P/E = 1.25), tricolporate with long, rather deep colpi and more or less distinct endopores. Exine stratification indistinct (LM). Ornamentation striate, without lumina between the muri.
Material studied: *Hartley*, TGH 10037, New Guinea.

The above descriptions agree with data in the literature, except for the P/E indices. The difference is especially large in *A. macrocarpa*: P/E = 0.92 in the present study, while Marticorena (1963) gives a value of *c.* 1.50. This is probably due to the fact that the long colpi easily fold inward and outward, which may partly depend on preparation technique, and which greatly changes the P/E index of a pollen grain. Probably, this variation correlates with the width and the depth of the colpi, so that all these characters are not useful in comparisons.

Obviously, the pollen of all four genera fits well in the Zanonioideae. Because of the stenopalynous nature of this subfamily nothing can be said about the (sub)tribal position of *Bayabusua*. Accepting its accommodation in the subtribe Zanoniinae, as indicated by macromorphology (De Wilde & Duyfjes 1999), the pollen of *Bayabusua* can be compared with that of *Alsomitra*, *Neoalsomitra* and *Zanonia*. *Bayabusua* pollen deviates from that of all three other genera by its very long colpi (often partly connected) and its striate ornamentation showing lumina between the muri. In *Neoalsomitra* and *Zanonia* the striate ornamentation does not show any lumina between the muri, while in *Alsomitra* the ornamentation is perforate to indistinctly rugulate, without any trace of striae. Pollen of *Neoalsomitra* and *Zanonia* is rather similar. Remarkable is the small pollen grain size in *Neoalsomitra* sp. 1, compared to that in *N.* sp. 2. It is the smallest pollen grain size known so far in the genus.

Concluding, the pollen of *Bayabusua* fits well in the subtribe Zanoniinae, although the other subtribes in the Zanonieae are hardly or not different, palynologically. It differs most from that of *Alsomitra*, and less so from that of *Neoalsomitra* and *Zanonia*, which are mutually rather similar.

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REFERENCES

Alyoshina, L.A. (1966) Palynological data on the systematics of the tribe Favilleae Pax of the family Cucurbitaceae Juss. *Botaniceskij Zurnal (Moskwa)* 55: 244–250.

——— (1971) Palynological data on the systematics and phylogeny of the family Cucurbitaceae Juss. In: L.A. Kuprianova & M.S. Jakovlev (eds.) *Pollen morphology—Cucurbitaceae, Thymelaeaceae, Cornaceae*. Academy of Sciences of the USSR, Komarov Botanical Institute, Leningrad. Pp. 5–103.

De Wilde, W.J.J.O. & B.E.E. Duyfjes (1999) *Bayabusua*, a new genus of Cucurbitaceae. *Sandakania* 13: 1–16.

Erdtman, G. (1952) *Pollen morphology and plant taxonomy. Angiosperms, an introduction to palynology 1*. Almqvist & Wiksell. Stockholm. 539 p.

Huang, T.C. (1972) *Pollen flora of Taiwan*. National Taiwan University Botany Department Press. Taipei. 297 p.

Jeffrey, C. (1964) A note on pollen morphology in Cucurbitaceae. *Kew Bulletin* 17: 473–477.

——— (1990) An outline classification of the Cucurbitaceae. In: D.M. Bates, R.W. Robinson & C. Jeffrey (eds.) *Biology and utilization of the Cucurbitaceae*. Comstock Publishing Associates, Cornell University Press, Ithaca & London. Pp. 449–463.

Marticorena, C. (1963) Material para una monografía de la morfología del polen de Cucurbitaceae. *Grana Palynologica* 4: 78–91.

Punt, W., S. Blackmore, S. Nilsson, & A. Le Thomas (1994) *Glossary of pollen and spore terminology*. LPP Contributions Series 1. LPP Foundation, Utrecht. 71 p.

Sharma, S. (1991) *Studies on the development of anther and palynology of Indian Cucurbitaceae*. Advances in Pollen Spore Research 18. Today & Tomorrow's Publishers, New Delhi. 150 p.

Telford, I.R. (1982) Cucurbitaceae. *Flora of Australia* 8: 158–198. Australian Government Publishing Service, Canberra.

Van der Ham, R.W.J.M. (1990) *Nephelieae pollen (Sapindaceae): form, function, and evolution*. Leiden Botanical Series 13. Rijksherbarium / Hortus Botanicus, Leiden. 255 p.